

Complete Summary

GUIDELINE TITLE

Modifications in endoscopic practice for pediatric patients.

BIBLIOGRAPHIC SOURCE(S)

Eisen GM, Chutkan R, Goldstein JL, Petersen BT, Ryan ME, Sherman S, Vargo JJ 2nd, Wright RA, Young HS, Catalano MF, Denstman F, Smith CD, Walter V V. Modifications in endoscopic practice for pediatric patients. *Gastrointest Endosc* 2000 Dec;52(6 Pt 1):838-42. [27 references] [PubMed](#)

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SCOPE

DISEASE/CONDITION(S)

Diseases or conditions requiring gastrointestinal endoscopy

Note: The indications for gastrointestinal endoscopy in the pediatric age group are similar to those for adult endoscopy.

GUIDELINE CATEGORY

Evaluation
Management
Risk Assessment

CLINICAL SPECIALTY

Gastroenterology
Pediatrics

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

To provide guidance regarding endoscopic practice issues that may differ in children

TARGET POPULATION

Pediatric patients (infants, children, adolescents) undergoing gastrointestinal endoscopy

Note: as physiologic age is a continuum, this document is not intended to apply rigidly defined age ranges. Where useful, such as among pediatric subsets, ages will be specified.

INTERVENTIONS AND PRACTICES CONSIDERED

Evaluation

Evaluation of signs and symptoms/indications for endoscopy

Management

Preprocedure Preparation

1. Parental or guardian informed consent
2. Provision of optimal age-appropriate information and counseling to the patients and parents
3. Oral, nasal, or rectal benzodiazepines (i.e., midazolam) to premedicate patients prior to intravenous conscious sedation
4. Fasting before endoscopy
5. Colon preparation based on patient's age, clinical state, and willingness/ability to comply
 - Normal saline enema
 - Polyethylene glycol (PEG)-electrolyte lavage
 - Oral laxatives including senna, bisacodyl, and osmotic agents

Sedation and Analgesia

1. Conscious sedation using midazolam, with or without fentanyl or meperidine
2. General anesthesia

Monitoring/Procedural Care

1. Pulse oximetry
2. Hemodynamic monitoring
3. Routine oxygen administration and rhythm monitoring

Equipment/Therapeutic Interventions

Use of equipment and interventions generally the same as for adult population, taking into account patient's smaller body size

MAJOR OUTCOMES CONSIDERED

- Anxiety level
- Negative behavior
- Tolerance for venipuncture and esophagogastroduodenoscopy (EGD)
- Degree of amnesia for intravenous (IV) insertion
- Patient and parental satisfaction
- Time to discharge

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Guidelines for the appropriate practice of endoscopy are based on critical review of the available data and expert consensus.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Not stated

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not applicable

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Indications and Contraindications

The indications for gastrointestinal endoscopy in the pediatric age group are similar to those for adult endoscopy. Signs and symptoms which are not often recognized in adult patients but may occasionally prompt endoscopy in extremely young or uncommunicative children, include failure to thrive, limitation of usual activities, or persistent refusal to eat. Indications for upper endoscopy, which are more common in children than adults, include known or suspected ingestion of a caustic material and ingestion of foreign bodies. Any foreign body impacted in the esophagus should be removed within 24 hours. Disk batteries should be removed urgently to prevent caustic or current induced esophageal injury. Most coins will pass to the stomach within 24 hours. Most gastric foreign bodies will pass uneventfully. High risk items, such as sharp, pointed, or elongated foreign bodies, should be removed promptly, as should objects exceeding 3 cm in length in an infant or young child and 5 cm in length in an older child or adolescent. Other objects can be observed with serial abdominal x-rays, every five days. Those not exiting the stomach, those caught in a fixed location on sequential films, and those causing symptoms should be removed. Upper endoscopy is the most useful means for evaluating esophageal or gastric injury by ingestion of caustic substances. Universal performance of esophagogastroduodenoscopy (EGD) in patients with known or suspected caustic ingestion is controversial, as serious sequelae (perforation or stricture formation) from esophageal burns are rare in the absence of oral burns or symptoms suggestive of injury. Examination within 12 to 24 hours after ingestion should certainly be performed in those with symptoms, oral injury, or confirmed ingestion of large volumes of highly alkaline (pH > 12.5) or acidic (pH < 2) substances.

Included among the indications for colonoscopy and flexible sigmoidoscopy are surveillance for neoplasia in those with hereditary polyposis syndromes and surveillance for rejection or other complications following intestinal transplantation.

Endoscopy is generally not indicated in pediatric patients for symptoms or radiologic signs of uncomplicated gastroesophageal reflux, uncomplicated functional abdominal pain, isolated pylorospasm, known congenital hypertrophic pyloric stenosis, constipation and encopresis, or inflammatory bowel disease responding to therapy.

The North American Society of Pediatric Gastroenterology and Nutrition (NASPGN) statement on indications does not discuss advanced procedures such as endoscopic retrograde cholangiopancreatography (ERCP) or endoscopic ultrasonography (EUS). In addition to the standard indications for all age groups, ERCP is indicated in pediatric practice for evaluation of neonatal and infantile cholestasis and when imaging and symptoms suggest choledochal cysts. The utility of EUS in pediatric age groups is still being explored. In addition to indications in adults, pediatric EUS is being evaluated for assessment of the anal sphincter in children with constipation or continence problems and for evaluation of enteric duplications.

Preprocedure Preparation

Preparation for endoscopy in pediatric age patients requires attention to physiologic issues as well as emotional and psychosocial issues in both the patient and the parent or guardian. Some of the anxiety engendered by endoscopy stems from preprocedure elements of intravenous line placement and separation from parents. Informed consent should be obtained from the appropriately designated parent or guardian, as stipulated by state regulation or statute. Provision of optimal age-appropriate information and counseling to the patients and parents aid in procedure tolerance by the child, as parental attitudes and fears are readily conveyed by nonverbal communication. One study randomized 60 patients aged 6 to 19 years old to psychological preparation versus routine measures prior to endoscopy. The study group patients were significantly less anxious prior to, and more cooperative during the procedure, exhibited less autonomic stimulation, and required less sedation.

Oral, nasal, and rectal administration of benzodiazepines have each been described as useful means of premedicating pediatric patients prior to intravenous conscious sedation or anesthesia. Peak serum concentrations and central nervous system (CNS) effects are reached 10 minutes after intranasal midazolam and about 30 to 35 minutes after oral ingestion. In a randomized controlled trial, intranasal midazolam (0.2 mg/kg) significantly reduced negative behaviors during separation from parents but did not influence tolerance for venipuncture or EGD, compared to intranasal saline. Discomfort and irritation from nasal administration largely negated the limited benefit on separation anxiety. Another placebo controlled trial evaluated oral ingestion of 0.5 mg/kg of midazolam in a flavored syrup (1:1 mixture of 2.5 mL syrup and 2.5 mL injectable midazolam 5 mg/mL = end dilution 2.5 mg/mL). Oral midazolam significantly improved the ease of separation from parents and of intravenous (IV) insertion, the degree of amnesia for IV insertion, comfort during the procedure, and both patient and parental

satisfaction scores. Physiologic monitoring parameters were not altered prior to, during, or after the procedure and there were no differences in preprocedure time, dosages of parenteral sedatives, procedure length, post-procedure recovery, or time to discharge.

In pediatric patients presumed to have normal gastric emptying, the fasting interval before endoscopy should be a minimum of two hours for clear liquids. Guidelines for fasting after ingestion of milk and solids are diverse and age-related. The American Academy of Pediatrics advises fasting from milk or solids for four hours in infants under five months, six hours in those 6 to 36 months, and eight hours in those over 36 months of age. Individual institutions often have particular preprocedure fasting guidelines which must be followed. Prolonged fasts without fluids are more difficult for young children, so morning procedures and timely schedules are desirable.

Preparation for colonoscopy in pediatric patients should be individualized based upon the patient's age, clinical state, and anticipated willingness or ability to comply with the chosen routine. There are no controlled research studies comparing colon preparation regimens in children. Clear liquids for 24 hours and a normal saline enema (5 cc/kg) will usually suffice for infants with normal or frequent bowel movements. For older children cleansing can be accomplished with intestinal lavage or dietary restrictions plus laxatives and enemas. Polyethylene glycol (PEG)-electrolyte lavage administered orally in a dose of 40 cc/kg/hr yielded clear stool after 2.6 hours in one study of 20 patients; however, nausea and emesis were relatively frequent. Oral laxatives, including senna, bisacodyl, and osmotic agents, can be safely used in reduced dosages by older children. Alternatives include:

1. Senna concentrate, 50 to 75 mL (contains 50 grams [GMS] sucrose in 75 mL), orally (PO) on the day prior to the procedure
2. Bisacodyl tablets or suppositories - ages 6 to 12: 5 mg PO or rectally (PR); over 12 years and adults: 10mg PO or PR. Some colon preparations, such as sodium phosphate (enema or oral) have been reported to cause fatal hypocalcemia and hypocalcemic tetany.

Sedation and Analgesia

Most gastrointestinal endoscopy is performed with the benefit of conscious sedation or general anesthesia. Conscious sedation refers to a controlled state of diminished consciousness wherein protective reflexes, the ability to respond to moderate physical or verbal stimuli, and ability to maintain a patent airway are retained. In contrast, deep sedation refers to a controlled state of depressed consciousness from which the patient is not easily aroused, with likely loss of protective airway reflexes and of the ability to maintain a patent airway. Several guidelines regarding conscious sedation and monitoring of adult and pediatric patients have been published.

Physiologic differences between pediatric and adult patients alter the risks for potentially serious complications during sedation and analgesia. When reduced further by prone or supine positions and especially by constraining garments or restraints hypoventilation may occur. Compared to adults, small and compliant pediatric airways yield significantly greater airflow resistance, which is further

magnified by the addition of even modest amounts of mucous or edema. In children the tongue fills the upper airway to a greater extent than in adults. Infants under 3 to 5 months are obligate nasal breathers. Tonsils and adenoids reach maximal proportions at around ages 5 to 7. Hence, children are much more prone to dynamic and static episodes of airway occlusion, with or without sedation. Hyperreactive airways are known to occur during and for several weeks after upper respiratory infections. They are generally considered contraindications to elective procedures requiring endotracheal intubation. Extrapolation to sedation and analgesia would suggest great caution in this setting, particularly for upper endoscopy. Finally, due to proportionally higher oxygen consumption, episodes of hypoxemia are more poorly tolerated in children than in adults.

Children tend to tolerate proportional fluid excess or deficiency better than adults; however, their small size and obligate insensible fluid losses due to thinner skin and greater surface to volume ratio predispose them to dehydration, particularly with onset of fever, diarrhea, or vomiting. The greater surface to volume ratio also predisposes them to more rapid heat loss and the potential for hypothermia during prolonged procedures. While the short duration of most endoscopic procedures does not contribute greatly to dehydration or hypothermia, children should be well draped and room temperatures should be appropriately adjusted to avoid this possibility.

Following early infancy, and in the absence of organ-specific pathology or dysfunction, sedative and analgesic drug effects and clearance are intact and proportionally approximate those seen in adults. Liver volume and proportional blood flow, relative to body weight, are significantly higher at birth than in adults. Following early maturation of metabolic function, drug clearance is intact. Neurologically impaired patients, including trisomy children and adults can be particularly sensitive to benzodiazepines and opiate/benzodiazepine combinations.

Pediatric conscious sedation is most commonly performed using midazolam, with or without fentanyl or meperidine. As in adults, incorporation of midazolam in sedation regimens yields improved amnesia effects in pediatric patients. Fentanyl plus midazolam may require lower doses of the benzodiazepine and shorter recovery times compared to meperidine plus midazolam. Administration should be weight based and titrated by response, allowing adequate time between doses to assess effects and need for additional medication. Despite anticipated differences in sedative dosages and metabolism, requirements for individual patients may vary significantly, based in part on their psychosocial development and attention to their surrounding environment by the endoscopy team. Not infrequently higher doses are ultimately required in the preschool, elementary, and pre-teenage groups.

General anesthesia is commonly employed for pediatric endoscopy, usually based upon age or anticipated patient intolerance for the procedure. Other indications may include the complexity of the planned procedure, physician preferences, patient comorbidities, or institutional guidelines. A recent prospective evaluation noted equivalent efficacy and safety, with markedly reduced costs when using rigorously standardized conscious sedation compared to general anesthesia for performance of endoscopy in children of all age groups. Higher doses of sedation were required in children 3 to 9 years of age, and deep sedation was often

reached, however. General anesthesia remains indicated for many procedures, based upon the above indications and institutional facilities and personnel.

Monitoring/Procedural Care

An individual trained in pediatric monitoring and at least basic pediatric life support should be present in addition to the endoscopist for the entire duration of sedated procedures. Advanced life support skills are preferable. The training and licensure of the monitoring personnel is often dictated by individual hospital or unit policies. Due to the depth of sedation commonly required and the frequency of progression to deep sedation, some centers have instituted multi-specialty pediatric sedation units, wherein intensivists, specialty nurses, or anesthesiologists provide uniform and consistent sedation and monitoring.

Pulse oximetry and hemodynamic monitoring should be routinely used during pediatric endoscopy. Routine oxygen administration and rhythm monitoring have been advocated, as data suggest a significant proportion of children develop oxygen desaturation and/or arrhythmias during conscious sedation for endoscopy.

Equipment

Resuscitative equipment should mirror that available for adult conscious sedation, with attention to the availability of devices of appropriate size and drug doses for all sizes and ages being treated. Necessary supplies include pediatric caliber intravenous tubing, arm boards, IV needles, face masks, oral and nasal airways, laryngoscopes, endotracheal tubes, and nasogastric tubes. An emergency or code cart stocked for representative age groups must be available.

Diameters of both adult and pediatric endoscopes are rapidly evolving. Some adult upper endoscopes have increased in caliber to improve the optics. Reduced caliber instruments are available for procedures in younger children and nonsedated adults. Standard adult gastroscopes (>9.7 mm diameter) are generally safe in children over 25 kg. More slender 5 to 8 mm instruments should be used for gastroscopy in smaller children and infants. Adult colonoscopes (11.7 to 13 mm diameter) are acceptable in teenage patients approaching adult size. Smaller, more flexible colonoscopes (<11.7 mm) are suitable for most average size preschool and elementary aged children. Small or standard upper scopes can be used for colonoscopy in infants and toddlers. They are stiffer than colonoscopes, however, so care should be taken to avoid excessive stretching of the splenic and hepatic flexures.

Therapeutic Interventions

Specific interventional techniques are largely the same in pediatric patients as in adult patients. Volumes for injectable agents and cautery settings should consider potentially increased local or systemic effects on the basis of smaller body size. No data are available regarding such effects however. Devices such as percutaneous gastrostomy tubes should be appropriate for lumen caliber and body size. Pediatric caliber biopsy forceps are designed for use through smaller endoscopes. Their reduced bite is also appropriate for the thinner small bowel and colonic mucosa of infants and young children.

Summary

Indications for endoscopy in pediatric patients vary minimally compared to the overall patient population. Sedation and analgesia requires heightened attention to dosing and effects of standard agents. Intensified monitoring is appropriate for many patients. Safe and effective diagnostic and therapeutic interventions can be expected in these age groups.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting each recommendation is not specifically stated.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate use of endoscopy procedures in pediatric patients

POTENTIAL HARMS

- Polyethylene glycol (PEG)-electrolyte lavage administered orally in a dose of 40 cc/kg/hr yielded clear stool after 2.6 hours in one study of 20 patients; however, nausea and emesis were relatively frequent.
- Some colon preparations, such as sodium phosphate (enema or oral) have been reported to cause fatal hypocalcemia and hypocalcemic tetany.
- Physiologic differences between pediatric and adult patients alter the risks for potentially serious complications during sedation and analgesia. When reduced further by prone or supine positions and especially by constraining garments or restraints, hypoventilation may occur.
- Children are much more prone to dynamic and static episodes of airway occlusion, with or without sedation.
- Due to proportionally higher oxygen consumption, episodes of hypoxemia are more poorly tolerated in children than in adults.
- Children tend to tolerate proportional fluid excess or deficiency better than adults; however, their small size and obligate insensible fluid losses due to thinner skin and greater surface to volume ratio, predispose them to dehydration, particularly with onset of fever, diarrhea or vomiting. The greater surface to volume ratio also predisposes them to more rapid heat loss and the potential for hypothermia during prolonged procedures.

CONTRAINDICATIONS

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Hyperreactive airways are known to occur during and for several weeks after upper respiratory infections. They are generally considered contraindications to elective procedures requiring endotracheal intubation.

QUALIFYING STATEMENTS

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- As physiologic age is a continuum, this document is not intended to apply to rigidly defined age ranges. Where useful, such as among pediatric subsets, ages will be specified.
- The information in this guideline is intended only to provide general information and not as a definitive basis for diagnosis or treatment in any particular case. It is very important that individuals consult their doctors about specific conditions.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness
Safety

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Eisen GM, Chutkan R, Goldstein JL, Petersen BT, Ryan ME, Sherman S, Vargo JJ 2nd, Wright RA, Young HS, Catalano MF, Denstman F, Smith CD, Walter V V. Modifications in endoscopic practice for pediatric patients. *Gastrointest Endosc* 2000 Dec;52(6 Pt 1):838-42. [27 references] [PubMed](#)

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2000 Dec

GUIDELINE DEVELOPER(S)

American Society for Gastrointestinal Endoscopy - Medical Specialty Society

SOURCE(S) OF FUNDING

American Society for Gastrointestinal Endoscopy

GUIDELINE COMMITTEE

Standards of Practice Committee

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available from the [American Society for Gastrointestinal Endoscopy Web site](#).

Print copies: Available from the American Society for Gastrointestinal Endoscopy,
1520 Kensington Road, Suite 202, Oak Brook, IL 60523.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on October 15, 2004. The information was verified by the guideline developer on November 5, 2004.

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